Plants: Ecology, Biology, & Food Source Research

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Wildfire, Conservation, and Restoration Ecology Research

Dr. Scott Abella

Associate Professor

School of Life Sciences

Email: scott.abella@unlv.edu

Websites: https://www.unlv.edu/people/scott-abella

https://abellaappliedecologylab.wordpress.com/home/

Expertise

- Fire ecology
- Restoration ecology
- Ecological conservation practices
- Forest health

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We perform fire ecology research that assists local and national wildland fire management efforts in changing environments

Before-after wildfire in Red Rock Canyon National Conservation Area, just outside Las Vegas. We study fire effects, fuel management, and restoration strategies.

UNLV biology students implementing post-fire habitat restoration research

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Forest Inventory and Analysis

- **Dr. Brenda J Buck**
- Professor
- Department of Geoscience
- Email: Brenda.Buck@unlv.edu
- Website: https://unlv-fia.github.io/UNLV-FIA-Group/index.html

Expertise

- University partner to USDA-FIA. Area of emphasis is information management research and development to optimize the storage, delivery, and display of forest inventory data.
- The support we provide helps policy makers, land stewards and non-governmental groups base decisions and assessments related to the health, diversity, and productivity of U.S. forests and grasslands on scientifically credible information.

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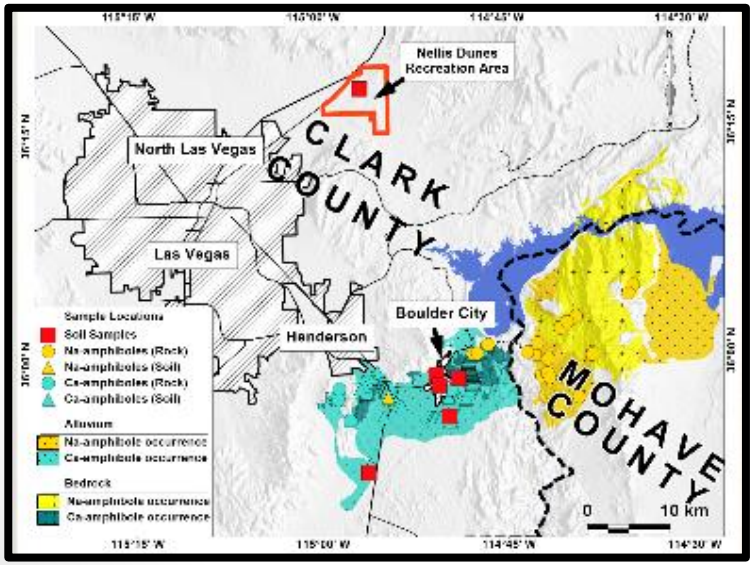
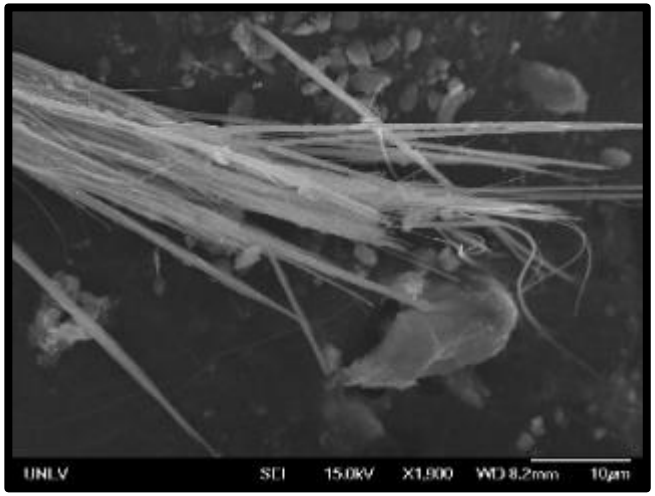
Medical Geology

- **Dr. Brenda J Buck**
- Professor
- Department of Geoscience
- Email: Brenda.Buck@unlv.edu

Expertise

- Expertise: Health effects of mineral dust; Asbestos; Heavy Metals; Soil Science/Geology





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Dr. Dale Devitt
Professor
Director - Center for Urban Water Conservation
School of Life Sciences
Phone 702-895-4699

Expertise

Soil Plant Water Relations
Water Management
Evapotranspiration
Salinity

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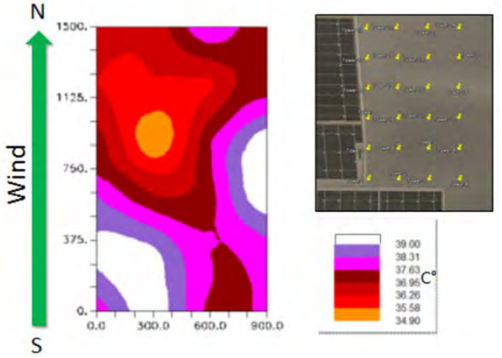
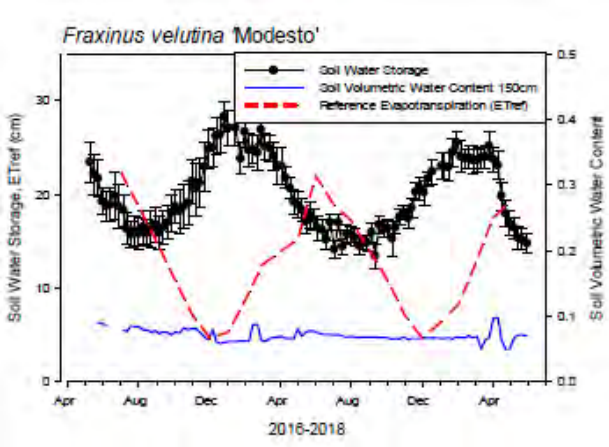
Current Research

- Assessing the impact of large scale solar development on desert ecosystems.



- Tree grass water use tradeoffs in urban landscapes



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10 acre research facility in North Las Vegas dedicated to conducting applied and basic water related research.

Response (growth, flower and seed production) of desert perennial shrubs to altered precipitation

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Tree physiological ecology

- **Dr. Drew Peltier**
- Assistant Profess
- School of Life Sciences
- Email: drew.Peltier@unlv.edu
- Website: drewpeltier.com

Expertise

- Dendroecology (tree rings)
- Tree mortality
- Ecophysiology
- Radiocarbon
- Bayesian statistics

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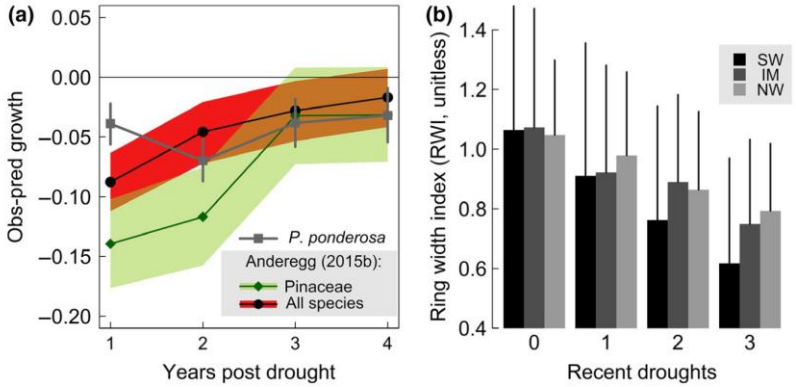
What do trees 'remember?'

Fire: *Redwood trees resprout from 1000+ year old buds, using 50-100 year old energy reserves.*



Drought: *Ponderosa pine ring width shows multi year legacies as drought becomes more frequent.*

Bark beetles: *Giant sequoia use 100+ year old energy reserves to survive bark beetle attack (note tree climber)*

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Dryland ecology, hydrology and climate dynamics

Dr. Matthew Petrie
Assistant Professor
School of Life Sciences
ph: 702-895-5844
e: matthew.petrie@unlv.edu

Expertise:

Vegetation ecology and near-surface hydrology
Forest regeneration
Climate dynamics and climate change forecasting
Extreme events
Landscape ecology
Manipulative field experimentation

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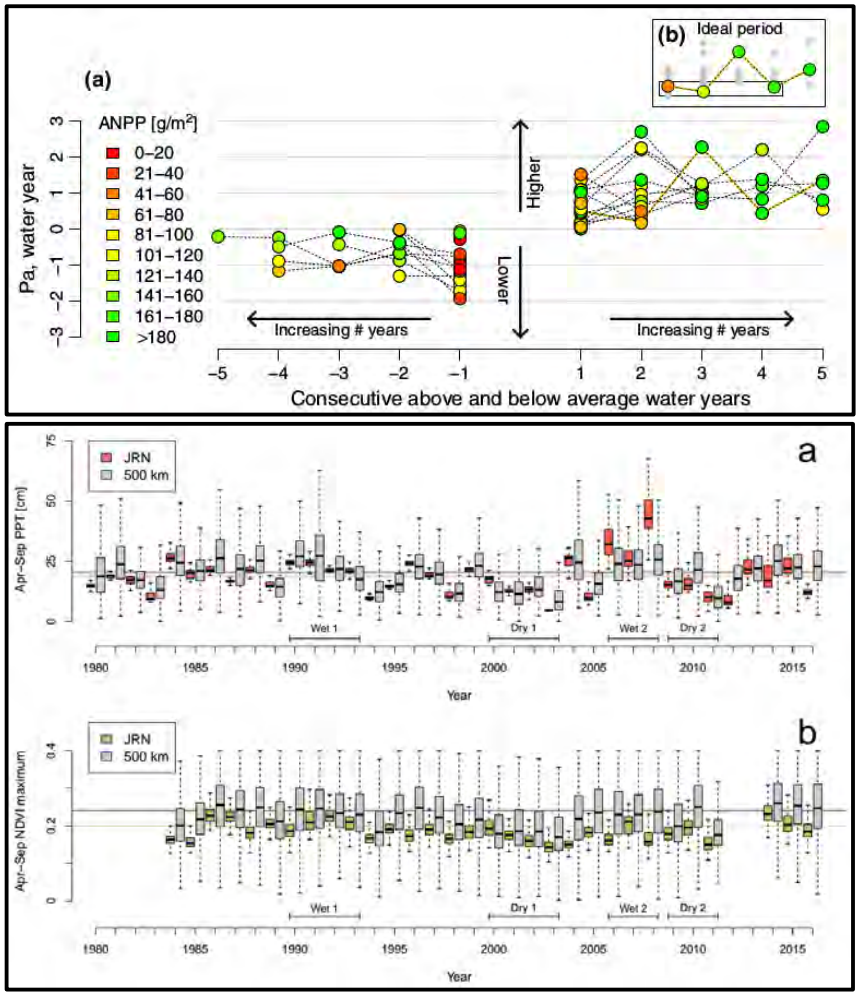
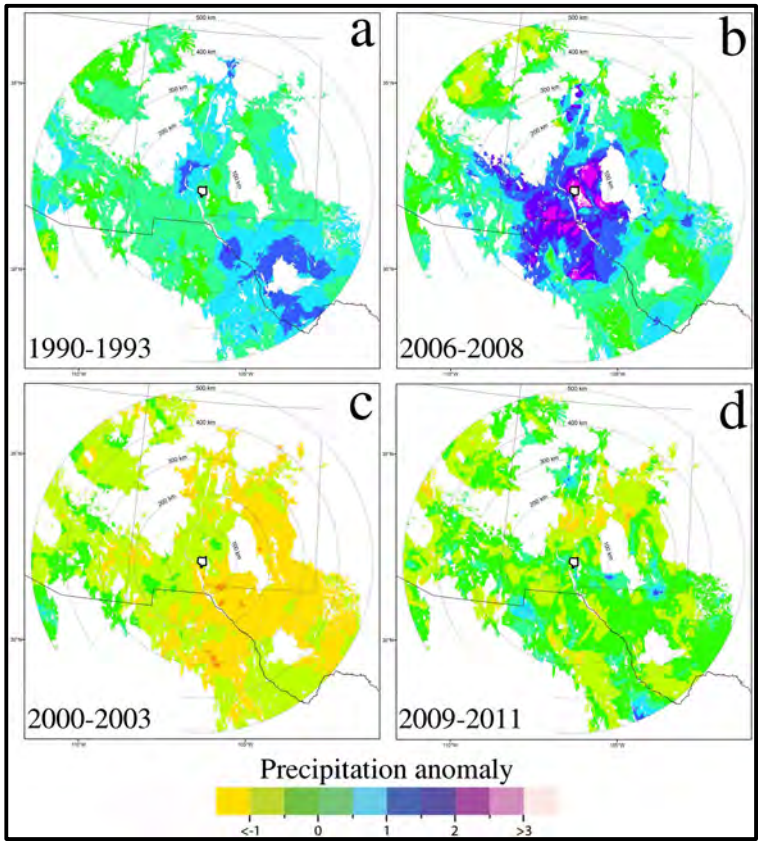
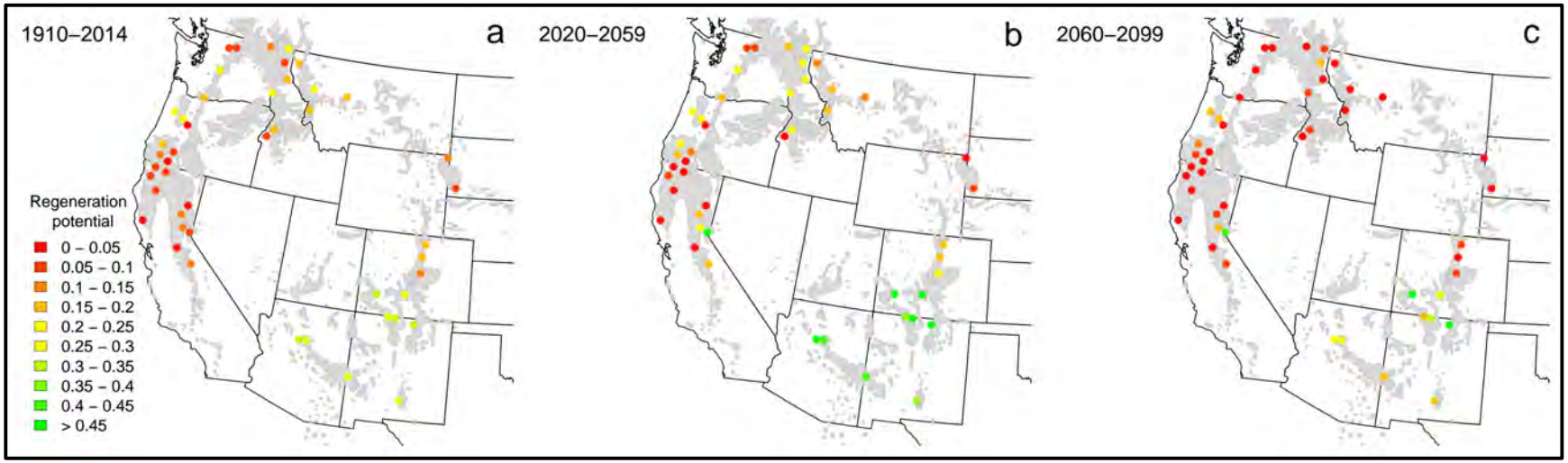
Linking extreme climate events and ecological dynamics across space and time

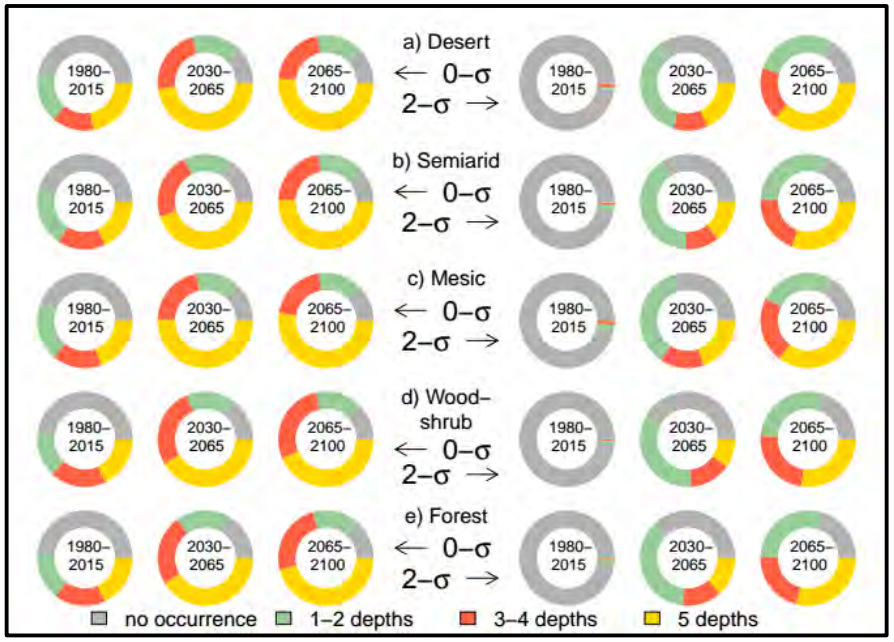




Above: Disentangling locally- and regionally-observed ecological responses to multiyear high and low rainfall periods. Multiyear periods are a key component of understanding climate impacts to arid and semiarid regions. Our research focuses on the physical mechanisms that shape ecological responses, providing a foundation for understanding the effects of local and regional extreme events in a changing climate.

Forecasting climate change impacts





Above: Natural forest regeneration may decline substantially throughout the western US in the 21st century. We study how climate, landscape properties, and the stress tolerance of tree populations will shape the future of western forests.

Left: Forecasts for increasing belowground extreme temperature events in a changing climate. We use downscaled climate model projections to forecast the increasing occurrence of moderate (0-σ) and very high (2-σ) extreme temperature events throughout multiple depths in the soil profile for ecosystems of the central and western US.

Evolutionary Biology

- **Dr. Javier A. Rodríguez**
- Professor of Biological Sciences
- School of Life Sciences
- Email: javier.rodriguez@unlv.edu
- Website: https://jrodriguez.faculty.unlv.edu/

Expertise

- Evolutionary Biology
- Feeding Ecology
- Genetic Divergence
- Biology of Amphibians and Reptiles

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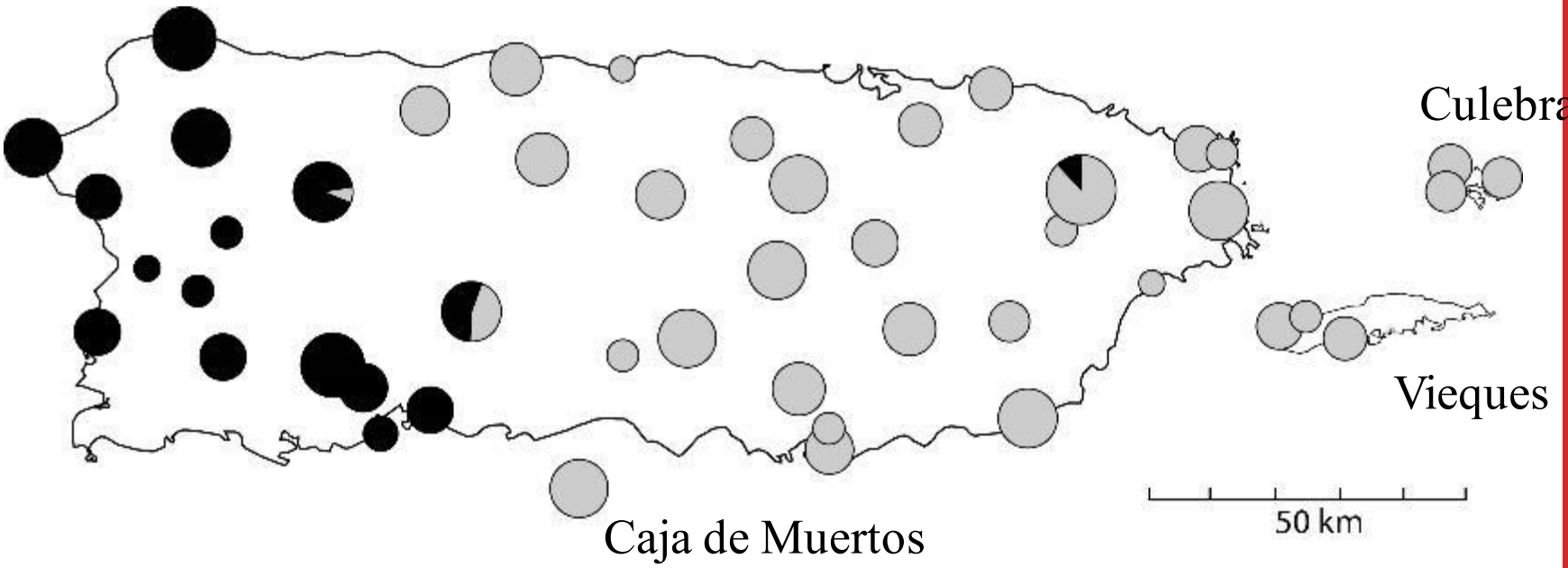
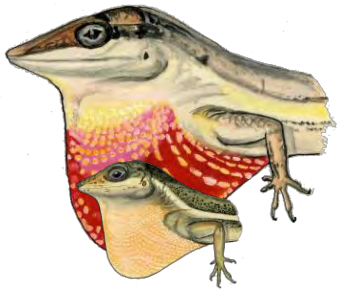
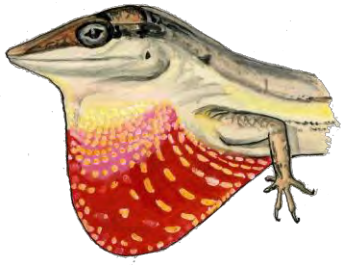


- Hybrids – *A. pulchellus* with *krugi* mtDNA, 85 individuals, 15 localities



- *A. pulchellus* with native mtDNA, 224 individuals, 39 localities



● = ≥ 95% pp support

Mona (n = 10)

C. m. monensis

Cayo Diablo (n = 14)

Puerto Rico (n = 5)

Culebra – Ensenada del Cementerio (n = 6)

Tortola I (n = 4)

Culebra – Punta Soldado (n = 2)

St. Thomas (n = 7)

Tortola II (n = 1)

Culebra – Bahía Mosquito (n = 1)

C. m. granti

C. inornatus (Puerto Rico)

C. gracilis (Hispaniola)

C. fordii (Hispaniola)

C. striatus (Hispaniola)

0.02 substitutions per site

Bayesian tree
1059 bp *Cyt b*
866 bp *ND4*

Computational biology and the physiology of plants

Dr. Paul J Schulte
Associate Professor,
School of Life Sciences
Email: paul.Schulte@unlv.edu

Expertise

- Plant water relations and transport processes
- Computational fluid dynamics
- Anatomy of transport tissues in plants

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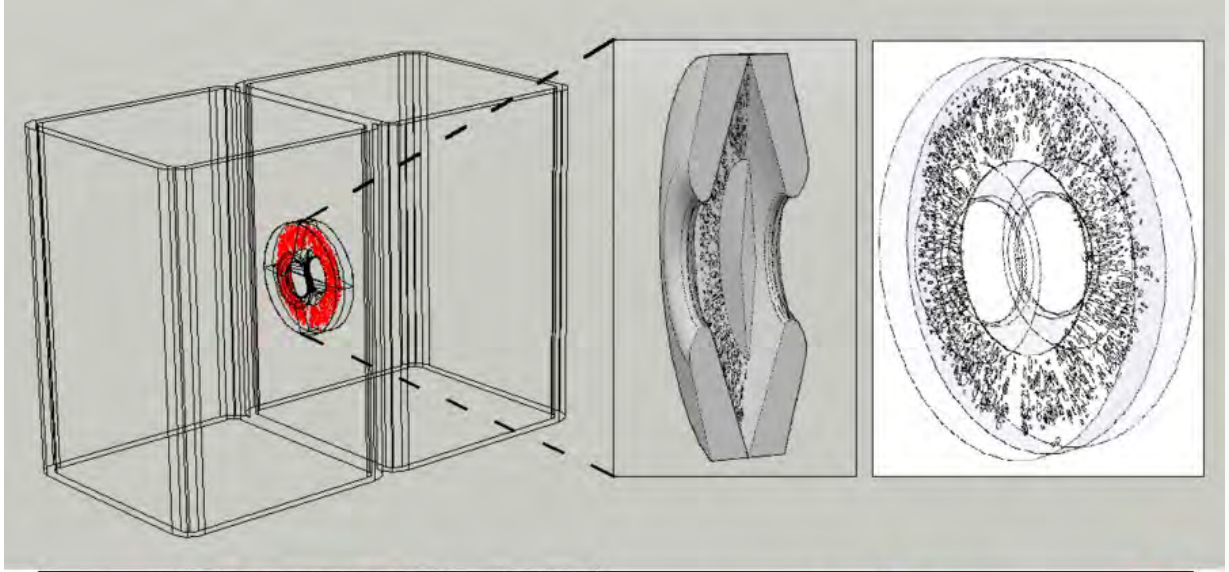
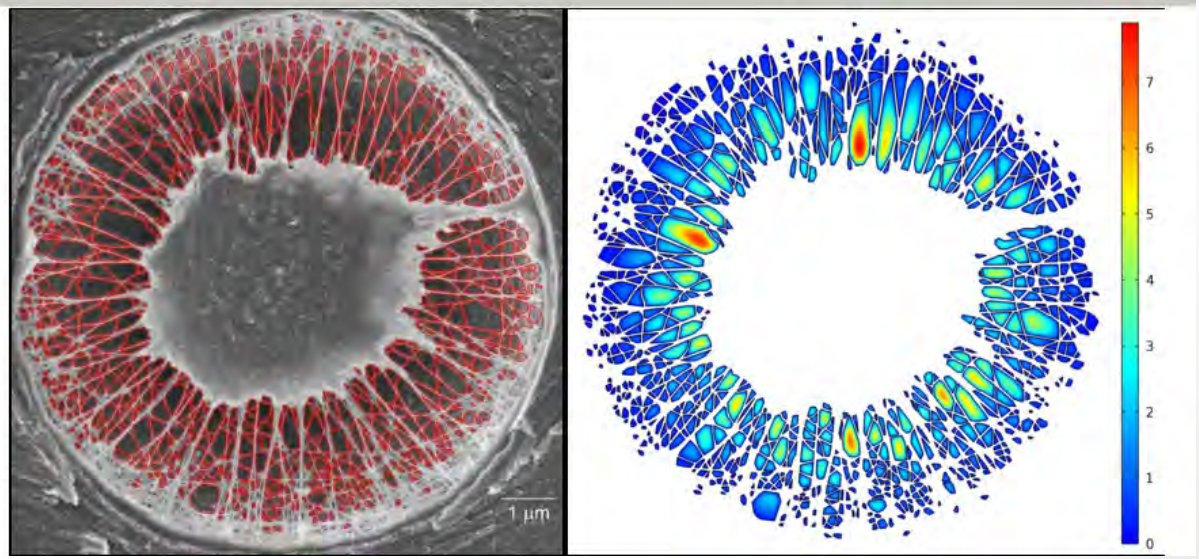
Fluid dynamics of flow between cells

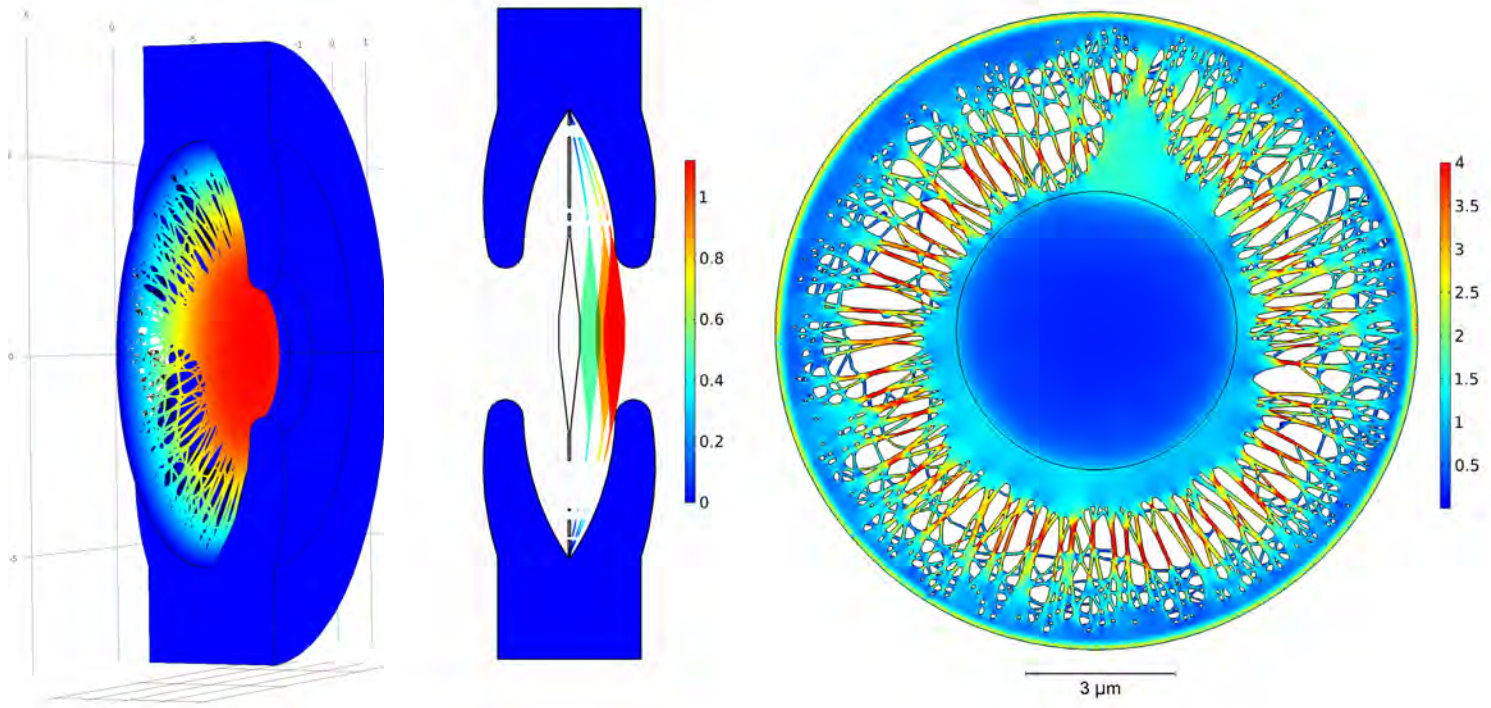
Computer models and mathematical approaches to studying transport processes can help us understand the roles that these structures play in the flow of water from roots to the leaves of tall trees.

These images show work based on a computational fluid dynamics approach to flow through pits in conifer tracheids.





Biomechanics of valves in plant cells



Water flows along the xylem in conifer trees from cell-to-cell through small openings called pits. The pits in many species contain structures that appear to act as valves that prevent air from spreading and blocking the transport system. The above figures show results from solid mechanics modeling of the pressures that are required to deflect the valve and seal the pit.

Speciation in Trees

- **Dr. Elizabeth A. Stacy**
- Professor
- School of Life Sciences
- Email: elizabeth.stacy@unlv.edu
- Website: https://estacy.faculty.unlv.edu/

Expertise

- Local Adaptation & Population Divergence
- Evolution of Reproductive Isolating Barriers
- Phylogeography & Phylogenomics
- Population Genomics
- Hawaiian Evolutionary Biology

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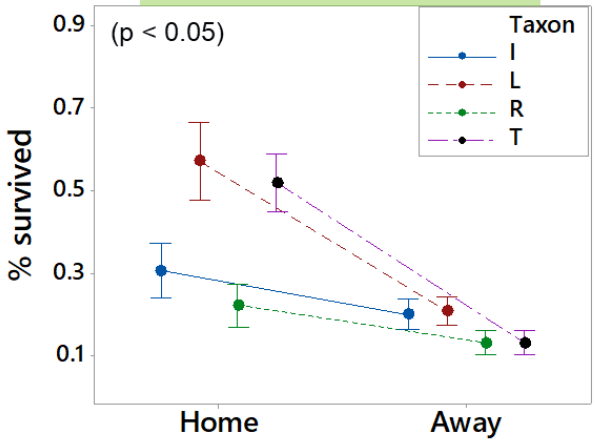
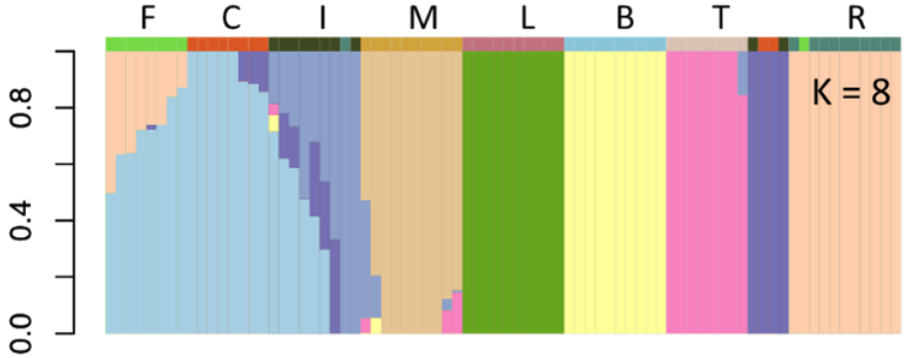
Evidence for diversification within Hawaiian *Metrosideros*

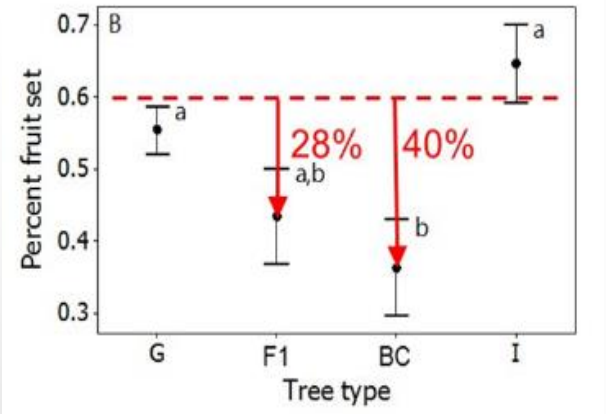
Survival @ 3.5 years



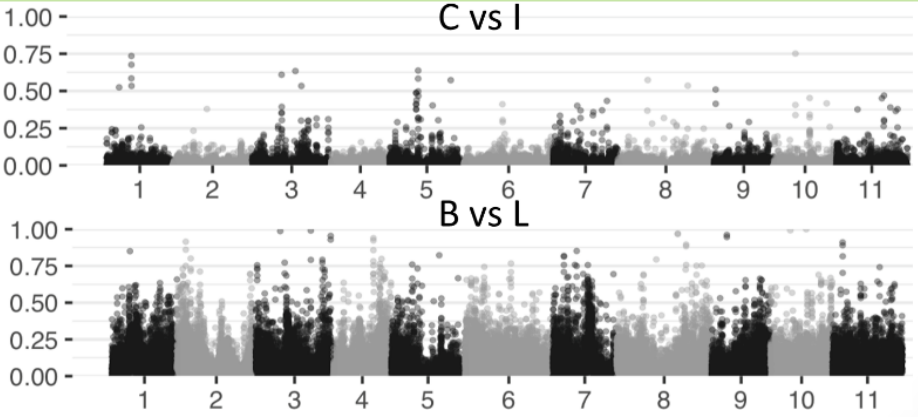
STRUCTURE analysis (8.5 million SNPs)



↓ F1 & backcross fertility



F_{ST} analysis to detect genomic islands of divergence



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Study system: Hawaiian *Metrosideros*

2.5-to-3.9-million-year-old incipient adaptive radiation of woody taxa that dominates Hawaiian forests





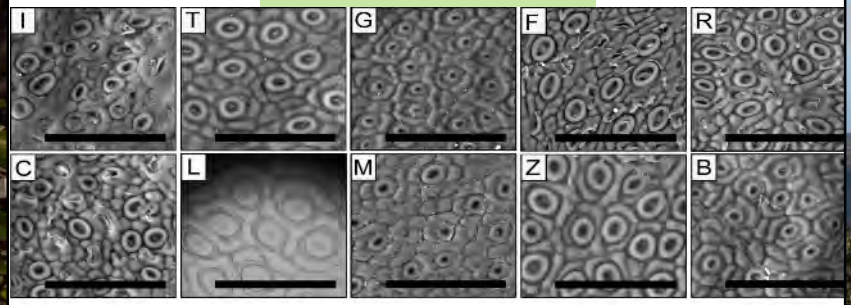




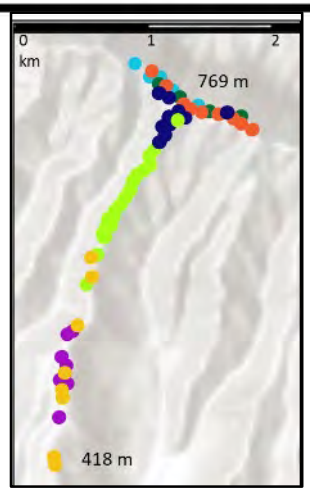
Adam Williams

Local Adaptation & Population Divergence

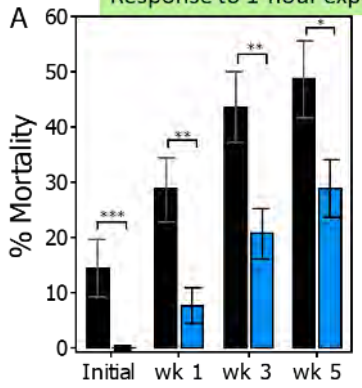
Leaf micromorphology

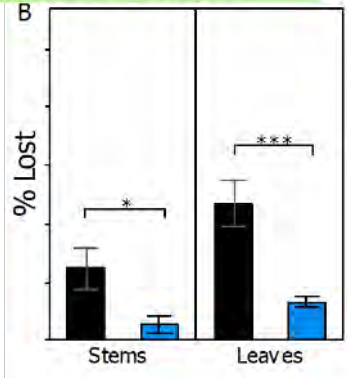


Lower elevation ⟷ Higher elevation

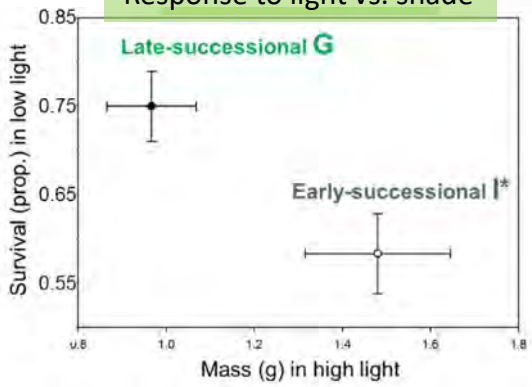


Response to 1-hour exposure to 2 m/s current

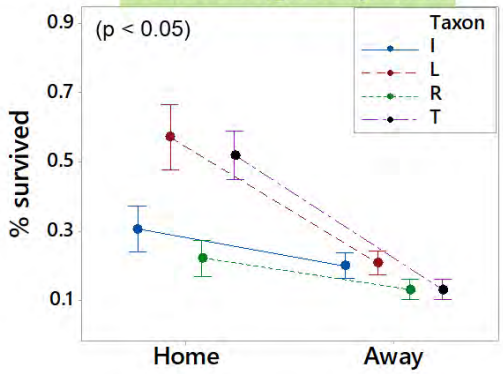




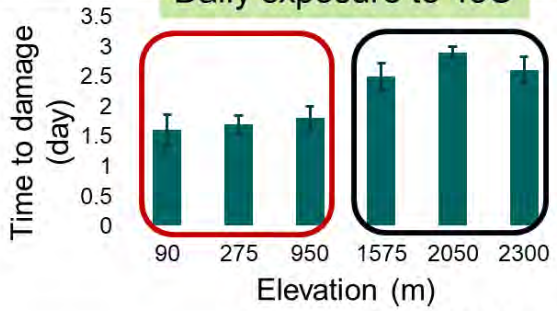
Response to light vs. shade



Survival @ 3.5 years



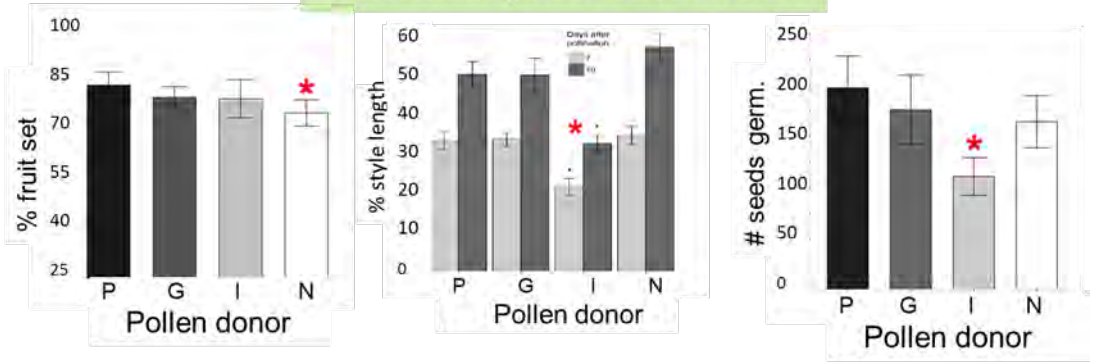
Daily exposure to 43C



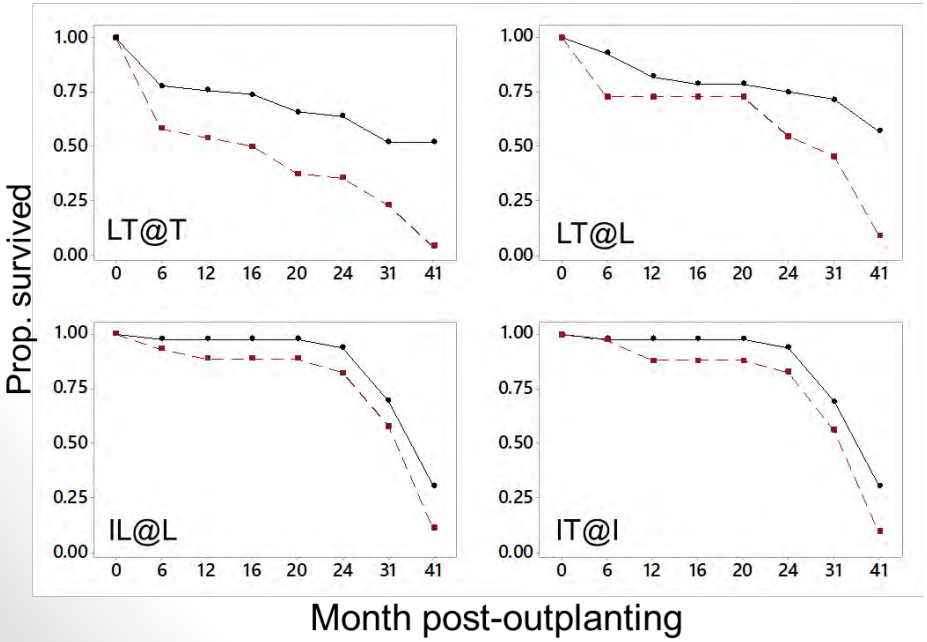
W=330, p=0.03

Evolution of Reproductive Isolating Barriers

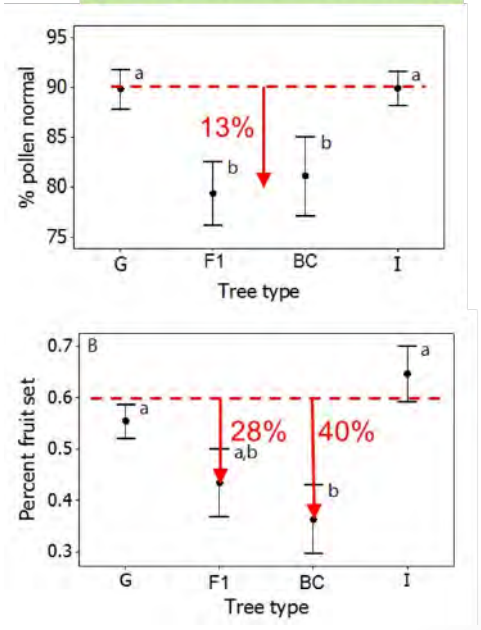
Cross-fertility between varieties



F1 inviability in maternal environment

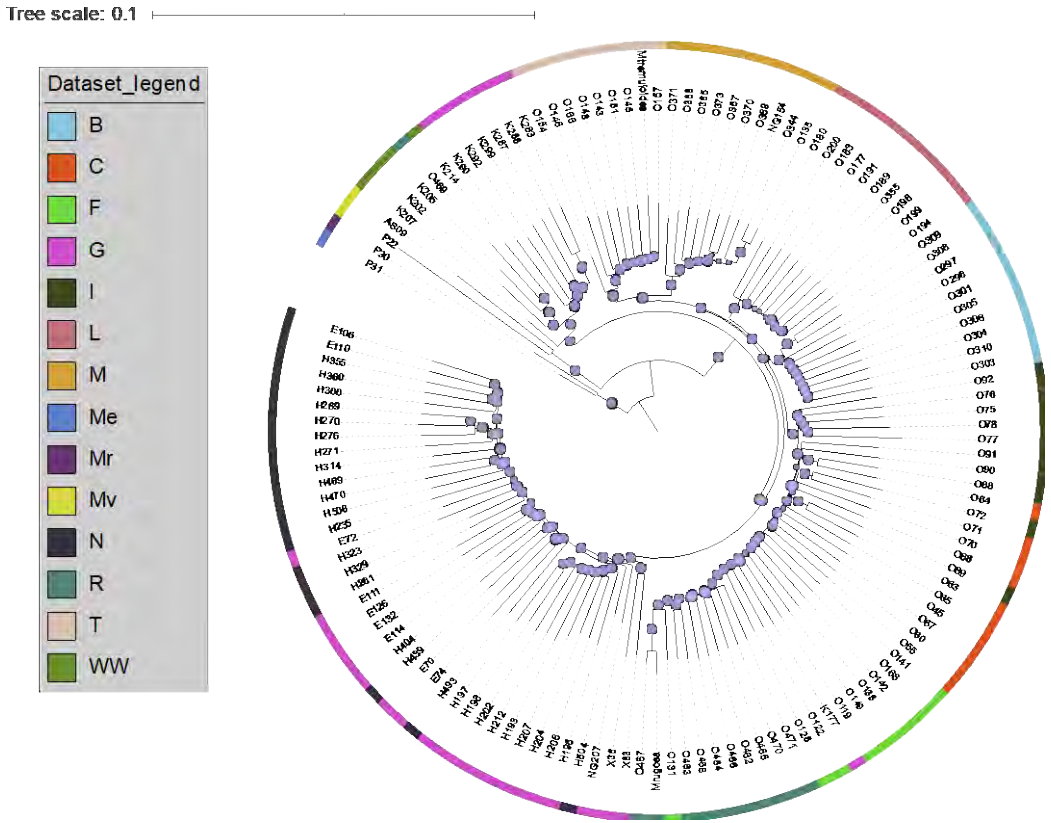


↓ F1 & backcross fertility

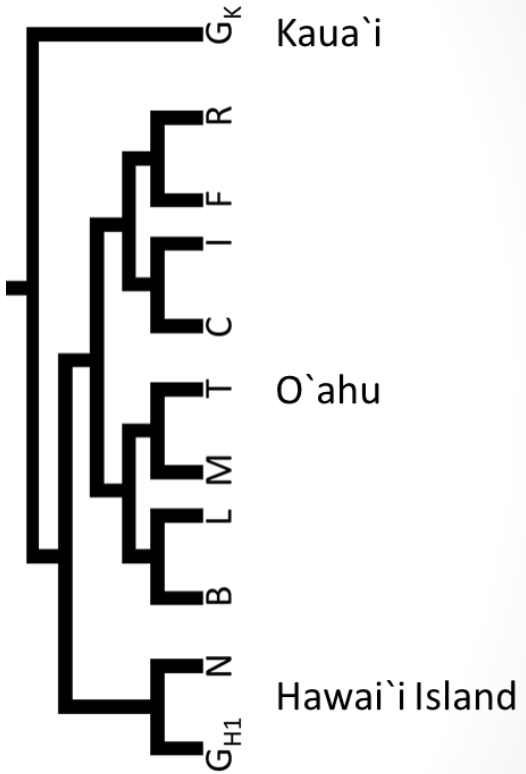


Phylogeography & Phylogenomics

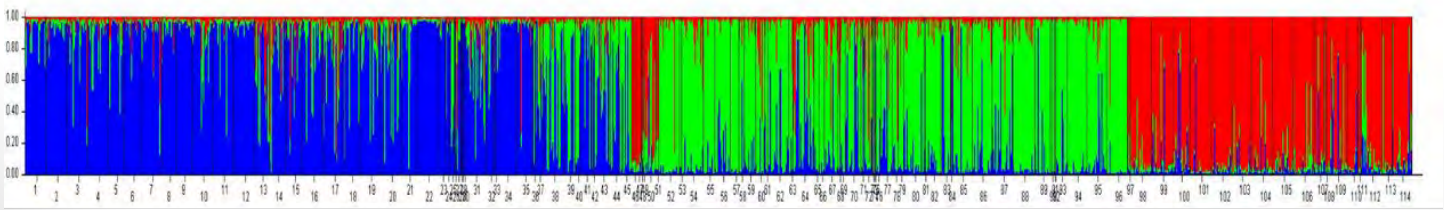
Phylogenomic analysis of 14 taxa (8.5 million genome-wide SNPs)



Phylogenetic analysis of 11 taxa (8.5 million genome-wide SNPs)

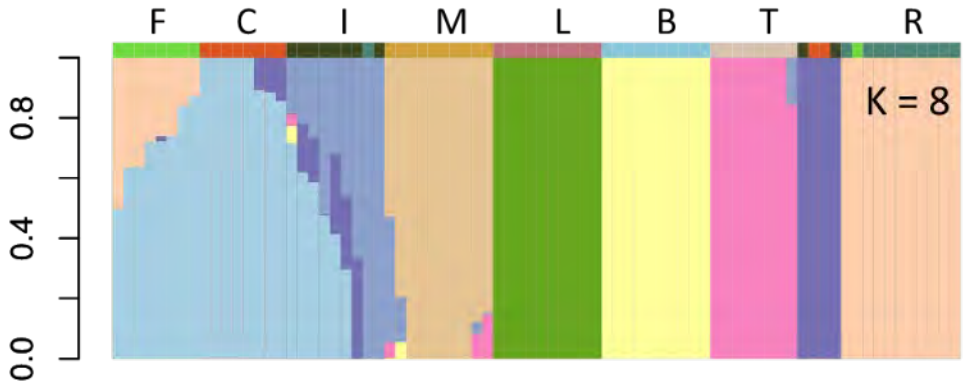


STRUCTURE analysis of 35 populations (9 nuclear SSR loci)

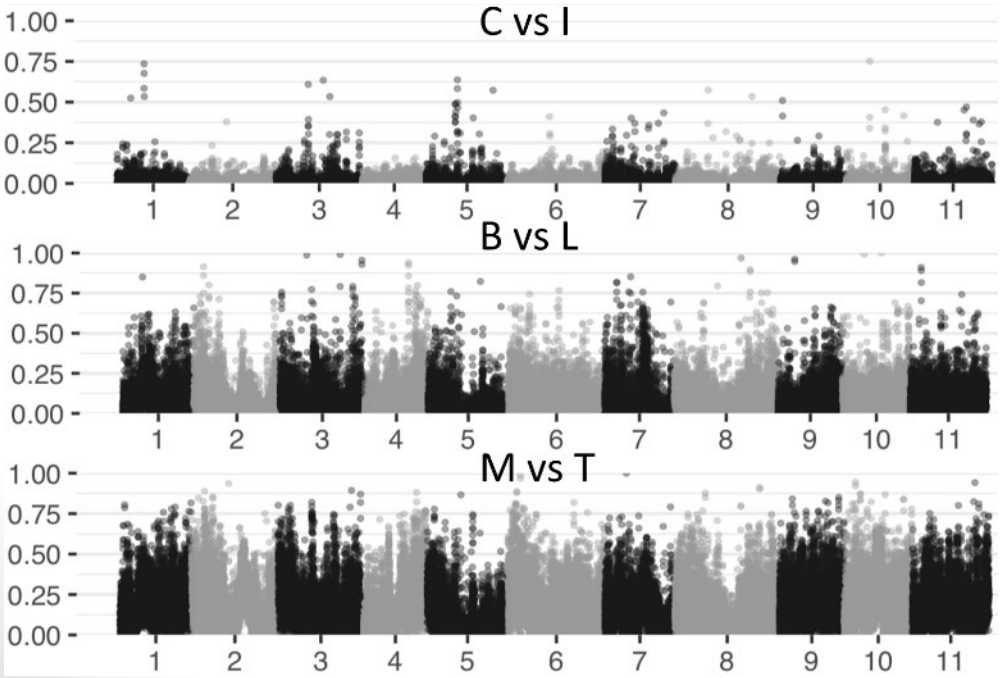


Population Genomics

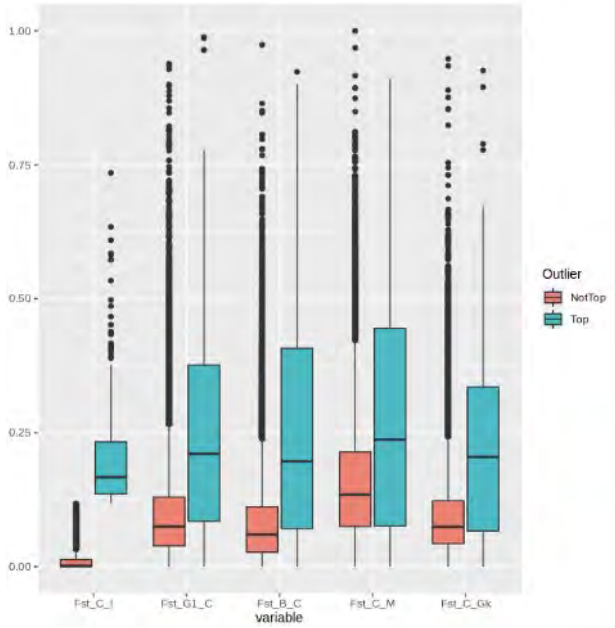
STRUCTURE analysis (8.5 million SNPs)



FST analysis to detect genomic islands of divergence



Selection analysis



Divergence time estimation